



PATENT
NON-FINAL

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

Shigeo KURE et al.

Serial Number: 09/740,969

Group Art Unit: 1764

Filed: December 21, 200

Examiner: W. D. Griffin

For: REACTOR FOR HYDROTREATING AND PROCESS FOR PRODUCING ULTRALOW
SULFUR HEAVY OILS BY THE USE OF THE REACTOR

**RESPONSE UNDER 37 C.F.R. § 1.111
TO THE FIRST OFFICE ACTION DATED DECEMBER 31, 2002**

Assistant Commissioner
for Patents
Washington, D.C. 20231

April 30, 2002

Sir:

This paper is submitted in response to the Office Action dated
December 31, 2002.

Reconsideration and removal of the rejections of the claims of
the application are respectfully requested in view of the remarks
that follow.

Initially, it is noted that the inventors of the present
invention have found that a reactor used in a process for

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hydrotreating, which contains plural hydrotreating catalyst layers having specific relationships to each other, i.e., $S_n \leq S_{n+1}$ and $1.15V_n \geq V_{n+1}$, wherein S represents the surface area per cubic meter of each hydrotreating catalyst layer; V represents the pore volume per cubic meter of each catalyst layer; and wherein n is a natural number representing the order of each catalyst layer, exhibits a total desulfurizing activity higher than that of reactors of the prior art (see page 2, line 25, to page 3, line 5, of the present specification). These relationships among plural hydrotreating catalyst layers is not disclosed or suggested by the prior art.

In the present action, the claims of the application are each based on Angevine, U.S. Patent No. 4,306,964, as a primary reference. It is respectfully submitted, however, that the examiner's interpretation of the disclosure of Angevine is not correct for the reasons explained below and that each of the rejections must fall.

The Angevine reference discloses only that hydrocarbon oils are effectively catalytically hydroprocessed by contacting the oil with catalysts - not catalyst layers - having sequentially decreasing average pore diameters (see column 4, lines 16 to 21).

The examiner, however, has made the following conclusions concerning the catalysts that are sequentially contacted in a reactor according to the invention of Angevine:

The catalysts in the layers have sequentially increasing surface areas. This would necessarily satisfy the relationship represented by the formula: $S_n \leq S_{n+1}$. The pore volumes shown in Table 1 would also satisfy the relationship represented by the formula: $1.15V_n \geq V_{n+1}$. (See col. 4, line 16 through col. 7, line 18).

(Action, page 3, lines 7-10).

The conclusion that the catalysts shown in Table 1 would satisfy the relationship represented by the formula: $1.15V_n \geq V_{n+1}$ is not supported by proper reasoning or evidence and is not correct.

First, applicants note that the pore volume in the relationship represented by the formula: $1.15V_n \geq V_{n+1}$ in the reactor and process claimed in the present application is the pore volume **per cubic meter** (i.e.. per the unit volume) of catalyst layer. On the other hand, the pore volume described in the Angevine reference

is **per gram** (i.e., per unit weight) (see Table 1 of Angevine) of catalyst particles contained in a catalyst bed, or layer.

Two catalyst layers (beds) which have the same pore volume **per gram** as each other do not always possess the same pore volume **per cubic meter** as each other. For instance, a catalyst layer A (volume of 1 m³; weight of 40 g; total pore volume of 20 cm³) and a catalyst layer B (volume of 1 m³; weight of 80g; total pore volume of 40 cm³) have the same pore volume **per gram** (0.5 cc/g), but are different from each other in pore volume **per cubic meter** because they are different from each other in bulk density.

Second, "Particle Density" in Table 1 of the Angevine reference is the density of individual catalyst particles (= weight of one catalyst particle ÷ volume of one catalyst particle). On the other hand, bulk density refers to an amount of a plurality of catalyst particles packed in a unit volume of a catalyst layer and is obtained from the following formula: (number of catalyst particles packed in a unit volume of a catalyst layer x particle density) ÷ unit volume of the catalyst layer.

Thus, particle density as described in Table 1 of Angevine is unrelated to bulk density (as defined above) which is required to

determine the pore volume **per cubic meter** of catalyst layer of the catalysts of Table 1 of the Angevine reference. Since Angevine discloses nothing concerning the bulk density of the catalyst layer, there is no basis to support a conclusion that "pore volumes shown in Table 1 would also satisfy the relationship represented by the formula: $1.15V_n \geq V_{n+1}$ " as argued in the action.

In view of the fact that the premise on which each of the rejections of the claims of the present application is based is not correct, namely, that pore volumes shown in Table 1 [of Angevine] would satisfy the relationship represented by the formula: $1.15V_n \geq V_{n+1}$, removal of the rejections is in order.¹

If, in view of the above rebuttal, the examiner maintains the position that the pore volumes shown in Table 1 [of Angevine] would satisfy the relationship represented by the formula: $1.15V_n \geq V_{n+1}$, he is respectfully requested to provide proper reasoning or evidence to support his position.

¹The Frye et al. and Gardener et al. secondary references do not disclose and do not suggest anything concerning the bulk density of catalyst particles packed in a catalyst layer and do not disclose and do not suggest the relationships represented by the formulae in the claims.

The foregoing is believed to be a complete and proper response to the Office Action dated December 31, 2001, and is believed to place this application in condition for allowance. If, however, minor issues remain that can be resolved by means of a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number indicated below.

In the event that this paper is not considered to be timely filed, applicants hereby petition for an appropriate extension of time. The fee for any such extension may be charged to our Deposit Account No. 111833.

In the event any additional fees are required, please also charge our Deposit Account No. 111833.

Respectfully submitted,
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